

**PARTICULATE MATTER
MONITORING NETWORK DESCRIPTION
FOR THE LAKE COUNTY
MONITORING PLANNING AREA**

PREPARED BY

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1.0 INTRODUCTION

This plan provides a description of the PM2.5 and PM10 ambient monitoring network designed for the Lake County Monitoring Planning Area (MPA). Airborne particles with aerodynamic diameter less than 10 microns (PM10) are small enough to be inhaled. The PM10 includes fine particles with aerodynamic diameter less than 2.5 microns (PM2.5) as a component. The deployment of the PM2.5 network is critical to the national implementation of the new PM2.5 National Ambient Air Quality Standards (NAAQS). The ambient data from this network will be used for designating areas as attainment or nonattainment, developing particulate matter control programs, and tracking the progress of such programs.

During the early stages of the PM2.5 network design process, the Air Resources Board (ARB) and the local air quality management districts established MPAs for the State. The entire State is covered by 18 MPAs. These MPAs will be used for planning monitoring locations for PM2.5. They are not intended for designating areas as attainment or nonattainment or planning control measures. The boundaries to be used for these purposes will not be established until adequate PM2.5 data are available. The ARB and the local air quality management districts will recommend appropriate nonattainment boundaries to the U.S. EPA.

The proposed PM2.5 monitoring network for the Lake County MPA includes one monitoring site. As in most cases throughout the State, this PM2.5 site will be located at an existing PM10 site. The site will be operated by the Lake County AQMD and will use a PM2.5 Federal Reference Method (FRM) monitor.

1.1. Physical Setting

The Lake County MPA includes all of Lake County which is located in Northern California.

1.2 Population Characteristics

The population of a Metropolitan Statistical Area (MSA) is one of the key parameters in determining the minimum number of required monitoring sites per the U.S. EPA PM2.5 regulations. There are no MSAs within Lake County.

Only Lake County is included in the Lake County MPA. The population of the county is listed in Table 1.2.1.

Table 1.2.1 Population in the Lake County MPA

<u>County</u>	<u>Population (in 1990)</u>
Lake County	54,165
Total Population	54,165

1.3 Climate and Weather

All of the Lake County MPA lies entirely within the North Coast Range. It constitutes one of the major terrain depressions of the region. It is much cooler than the central valley and has a climate similar to that of the North Coast region in inland areas. Between storm periods, nighttime cooling usually leads to the formation of ground fog in sheltered inland valleys. Considerable air stagnation occurs when these radiation fogs persist for several days. The winter weather types in the region bring generally favorable ventilation conditions. Because the air aloft is still relatively cold in the spring months, the atmosphere tends to become unstable. This instability is conducive to vertical air motion and generally favorable ventilation. During summer, most of the storm tracks are deflected far to the north of California as the semi-permanent Pacific high migrates northward. The Lake County area seldom receives precipitation from Pacific storms during this time of year. In the fall, radiation inversions with accompanying ground fog occur during the periods of clear skies and light winds. Pressure gradients are generally weak at this time of the year with the result that the lowest mean wind speeds occur during fall months.

1.4 Dominant Economic Activities and Emission Sources

In the Lake County MPA, recreation has been an important facet of the economy for decades. Agriculture constitutes an important source of Lake County livelihood also. Arable land is scattered.

The PM_{2.5} in California's air is the result of primary and secondary particulates. Primary particulate emissions are directly emitted from sources such as residential fireplaces, diesel trucks, forest burning, dust sources, and industrial processes. Secondary particulates form when gaseous or non-particulate substances react in the atmosphere with other substances to produce particulate matter.

The predominant sources of directly emitted PM_{2.5} vary regionally in California. The Lake County MPA emission inventory estimates show that the largest contributors of directly emitted PM_{2.5} are burning (including wildfires and fires, residential fuel consumption, waste burning and disposal) and unpaved road dust. Other sources are estimated to be less substantial PM_{2.5} contributors.

Precursors to secondary PM_{2.5} formation in California include oxides of nitrogen (NO_x)

from motor vehicles and other combustion sources, ammonia emissions, certain organic substances which form particulate matter, and additional emission sources. Secondary particulate levels are highly variable and are dependent on atmospheric conditions and precursor levels for formation. For example, in some regions at certain times of the year the secondary particles can comprise 50% or more of the total ambient measured PM_{2.5} concentrations. At other times, the secondary particulates are nearly negligible. Because secondary particles form through complex and variable atmospheric processes, it is not currently possible to produce accurate secondary particulate emission estimates as can now be done for the primary, directly emitted PM_{2.5}.

1.5 PM_{2.5} Monitoring Requirements

Based upon the U.S. EPA PM_{2.5} regulations, all Metropolitan Statistical Areas with population greater than 200,000 are required to have a core PM_{2.5} SLAMS (this is a site in a populated area representing PM_{2.5} concentrations on a neighborhood or urban scale). The required number of core SLAMS and the sampling frequency are determined by the 1990 census population statistics for each MSA. In general, the greater the population in an MSA, the more monitoring sites required for that area. One additional core PM_{2.5} monitor that samples everyday is required for each Photochemical Assessment Monitoring Station (PAMS) area included in the MPA.

In the Lake County Monitoring Planning Area, there are no MSAs and the Lake County MPA is not required to have a core PM_{2.5} monitoring site.

The regulations also require a PM_{2.5} monitor for every 200,000 people living either outside of an MSA or in MSAs with fewer than 200,000 people. These additional sites are supposed to sample for PM_{2.5} once every three days. There were 54,165 people living in the Lake County MPA based on the 1990 census. No sites are needed to satisfy the requirement for PM_{2.5} monitoring within outlying areas in State. However, one site will be deployed to provide geographical coverage over this portion of the State.

Table 1.5.1 identifies the number of core PM_{2.5} monitoring sites to be operated within the Lake County MPA.

Table 1.5.1 Required and Planned Core PM2.5 Monitoring Sites

MSA/PMSA/County	Population in 1990	Required Core PM2.5 Monitoring Sites		Planned Monitoring Sites
		Sampling everyday	Sampling 1 in 3 day	
Lake County	54,165	0	0	1
Total	54,165	0	0	1

2.0 PM2.5 MONITORING NETWORK ELEMENTS

This section summarizes PM2.5 monitoring sites planned for deployment in 1998 and 1999. In most cases, the existing particulate matter monitoring sites will be used for the additional PM2.5 monitoring. The existing particulate matter data have assisted in the design of the PM2.5 network by providing information on the trends and the magnitude of concentrations. These data will be valuable in the future in understanding the particulate size distributions of emission sources and developing control strategies. The particulate matter monitors currently operating at the site selected for PM2.5 monitoring are also summarized in this section.

Refer to Section 2.0 in the California Particulate Matter Monitoring Network Description for a summary of particulate matter monitoring outside of the PM2.5 monitoring network.

2.1 PM2.5 Monitors Planned for Deployment

The planned PM2.5 monitoring network will collect data for multiple objectives, including:

- (1) Comparing sampling results with the PM2.5 NAAQS to determine attainment/nonattainment status.
- (2) Developing and tracking implementation plans for the area.
- (3) Assisting health studies and other ambient aerosol research activities.

In order to understand the nature of the PM2.5 problem in different regions of the State and to develop control strategies, multiple monitor types may be needed. The Federal Reference Method (FRM) sampler is a gravimetric filter-based sampler that produces a concentration measurement of PM2.5 over a 24-hour period. The FRM alone cannot support the multiple information needs of the PM2.5 network. The sampler design includes a Teflon filter that can experience a loss of volatile constituents, which can be captured and retained better by other sampling techniques. In addition, it does not provide temporally resolved data or full chemical characterization of ambient aerosols.

In some areas, two other types of instruments are required for deployment as part of the PM2.5 network: speciation samplers and continuous mass monitors. Speciation samplers provide a chemical characterization of ambient aerosols for developing emission mitigation strategies and for tracking the success of implemented control programs. Continuous PM2.5 mass monitors will collect data for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. Due to low levels of PM10 from past sampling in Lake County, only one PM2.5 monitoring site will be deployed initially for this MPA. This site will begin operation in 1998 with an FRM type sampler purchased through the National PM2.5 Procurement Contract established by the U.S. EPA.

Table 2.1.1 lists monitoring site and the type of instruments planned at this site. The

location of the proposed site are presented on the map (Figure 2.1.1).

Table 2.1.1 PM2.5 Monitoring Network

Site Location	AIRS Site ID	PM2.5 FRM	PM2.5 Speciation	PM2.5 TEOM/BAM	Other PM2.5 Monitor
Lakeport-Lakeport Blvd	060333001	X			

Codes:

- X Monitor to be deployed in 1998
- Y Monitor to be deployed in 1999
- XX Collocated particulate monitors used for precision data to be deployed in 1998

2.2 Existing Particulate Matter Monitors

The existing particulate matter network in the Lake County MPA consists of three monitoring sites. The monitoring instruments operating at these sites include:

- ▶ 1 High Volume Size Selective Inlet (SSI) samplers collecting 24-hour PM10 samples.
- ▶ 2 monochotomus samplers collecting samples for analysis only.
- ▶ 1 coefficient of haze instruments.
- ▶ 1 nephelometers.

The PM2.5 site will be located at the existing PM10 site at Lakeport-Lakeport Blvd. Table 2.2.1 summarizes the particulate matter monitoring resources available at the proposed PM2.5 monitoring site. The complete summary of particulate matter monitoring resources in Lake County can be found in Attachment 1 in the statewide summary.

The particulate matter data obtained from these monitoring sites are used to meet the following objectives:

- ▶ Compare measured concentrations to the State and federal PM10 standards.
- ▶ Track changes in the particulate matter concentrations over time.
- ▶ Evaluate the population exposure.
- ▶ Assess the impact from transported particulate matter.
- ▶ Assist in health studies and other research.

Figure 2.1.1

2.3 PM2.5 Quality Assurance

The agencies operating PM2.5 monitors in the Lake County MPA will adopt a schedule for implementing quality assurance procedures developed by the ARB. Please refer to Section 3.7 in the statewide summary for more information about the schedule.

2.4 Laboratory Analyses

The FRM instruments collect PM2.5 over 24-hour periods on Teflon-membrane filters from air drawn at a controlled flow rate through a tested PM2.5 inlet. Within 96 hours after the sample collection period, the filter contained in the filter cassette will be removed from the sampler and placed in a protective container. During the period between filter retrieval from the sampler and the start of conditioning, the filter will be maintained at a temperature below 25 degrees centigrade. The filters will be transported to the mass analysis facility. The filters containing PM2.5 samples will be “conditioned” and weighed at the laboratory. It is currently proposed that the Bay Area AQMD laboratory will weigh the PM2.5 filters from Lake County, but the final decision has not yet been made.

Samples collected from the speciation monitors will be analyzed by a nationwide network of 1 to 3 laboratories. These laboratories will be working under contract performing the necessary laboratory analyses. The establishment of this network of laboratories is still under development, with the specific laboratories yet to be determined.

Table 2.2.1 Existing Particulate Matter Monitors at Proposed PM2.5 Site

Site Location	AIRS Site ID	Dichot	PM10 SSI	PM10 TEOM/BAM	Other PM Monitors
Lakeport-Lakeport Blvd	060333001		X		COH, Neph

Codes:

X	Existing monitor
COH	AISI tape sampler for soiling index (coefficient of haze)
Neph	Light scatter (nephelometer)
SSI	High Volume Size Selective Inlet sampler collecting 24-hour PM10 samples
Dichot	Dichotomous sampler collecting 24-hour fine fraction and coarse fraction samples
TEOM	Tapered Element Oscillating Microbalance collecting PM10 measurements hourly
BAM	Beta Attenuation Monitor collecting PM10 measurements hourly

3.0 PM2.5 MONITORING SITES TO BE DEPLOYED IN 1998

During 1998, one PM2.5 monitoring site is planned for deployment in the Lake County MPA. This section discusses the criteria used in the selection of the one PM2.5 monitoring site along with the important parameters that characterize this site.

3.1 Monitor Siting

The existing particulate matter network in the Lake County MPA consists of three sites. During the PM2.5 site selection process, the following factors were evaluated:

- ▶ Population statistics and distribution.
- ▶ Land use characteristics.
- ▶ Local climate.
- ▶ Suspected area emission sources (wood smoke, agricultural burning, etc.).
- ▶ Existing particulate matter monitoring network.
- ▶ Existing particulate matter data, including data collected by the dichotomous network, PM10 network, and special studies.
- ▶ Potential transport corridors.
- ▶ Ongoing special health studies.

After the review process, it was determined that the existing PM10 site would be well suited as a location for monitoring PM2.5.

3.2 Site Description

The network for the Lake County MPA, as proposed, includes one site that will be deployed in 1998. The following characteristics apply to the proposed site:

- ▶ Uses a Federal Reference Monitor (FRM) type sampler purchased through the national contract established by the U.S. EPA.
- ▶ Sited in a population-oriented location.
- ▶ “Site Type” is Core SLAMS.
- ▶ Represents neighborhood spatial scale.
- ▶ Provides data that will be compared to both the annual standard and the 24-hour standard.

Based on these criteria, the following site listed in Table 3.2.1 is identified for use for PM2.5 monitoring within the Lake County MPA.

Table 3.2.1 PM2.5 Monitoring Sites to be Deployed in 1998

Site Location	AIRS Site ID	Operating Agency	Spatial Scale	Monitoring Objective	Site Type	Measurement Method
Lakeport-Lakeport Blvd	060333001	LAK	Neighborhood	M	C	FRM/SCH

The following codes are used in this table:

Operating Agency :

LAK Lake County Air Quality Management District

Monitoring Objectives:

R Represent high concentrations in a populated area.
M Determine the highest concentration expected to occur in the area covered by the network (more than one site per area may be needed).
T Determine the extent of regional pollutant transport.
HS To support special health studies.
P Monitoring at PAMS areas

Site Type:

C Core SLAMS
S Non-core SLAMS
P Special Purpose Monitors

Measurement Method :

FRM/SCH Federal Reference Method Single Channel Sampler
FRM/SQ Federal Reference Method Sequential Sampler

4.0 PM2.5 MONITORING SITES TO BE DEPLOYED IN 1999

There are no plans to establish additional PM2.5 monitoring sites in 1999 within the Lake County MPA.

4.1 Monitoring Sites Operating PM2.5 FRM Monitors

At this time, there are no plans to deploy any additional monitoring sites in 1999 operating an FRM monitor.

4.2 PM2.5 Chemical Speciation Sampling

The basic objective of the PM2.5 chemical speciation sampling and analysis program is to develop seasonal and annual chemical characterizations and distributions, across the country, of the ambient aerosols present in PM2.5 samples. These chemically resolved data will be used to perform source attribution analyses, evaluate emission inventories and air quality models, and support health related research studies. There are no sites planned for Lake County that will include chemical speciation analyses.

4.3 Continuous PM2.5 Monitoring

The Federal regulation 40 CFR 58, Appendix D, 2.8.2.3, requires that continuous PM2.5 samplers be placed in metropolitan areas where there is a population greater than 1 million people. Continuous PM2.5 data provides useful data for public reporting of short-term concentrations, for understanding diurnal and episodic behavior of fine particles, and for use by health scientists investigating exposure patterns. The Lake County MPA is not required to have continuous PM2.5 monitoring. There are no plans to deploy a continuous PM2.5 monitor in this MPA.

5.0 SAMPLING FREQUENCY

The U.S. EPA requirements call for everyday sampling of PM_{2.5} at certain core SLAMS and one-in-three-day sampling at all other PM_{2.5} sites and all PM₁₀ sites. In order to collect sufficient data and at the same time conserve monitoring resources, the ARB and the local air quality management districts are proposing alternative sampling frequencies for PM_{2.5} and PM₁₀.

5.1 PM_{2.5} FRM Sampling Frequency

Everyday sampling is not required in the Lake County MPA as specified in the regulations, i.e., two sites per area over 500,000 population and one site per PAMS area. All other core PM_{2.5} monitoring sites are required to collect a sample once every three days. The one monitoring site that will be established in the Lake County MPA will have a 1-in-6-day sampling frequency.

The ARB along with the Lake County Air Quality Management District proposed that PM_{2.5} monitoring be conducted on a 1-in-6-day schedule year-round. This sampling frequency should be adequate to determine compliance with the new national PM_{2.5} annual and 24-hour standards given that the historic PM₁₀ concentrations are significantly below the PM_{2.5} standards. The annual PM₁₀ concentrations at Lakeport are approximately 65% of the annual PM_{2.5} standard and less than half of the 24-hour PM_{2.5} standard. The air quality control agencies will reevaluate the sampling schedule during next year's annual network review.

Table 5.1.1 PM_{2.5} FRM Sampling Frequency

Site Location	AIRS Site ID	Operating Agency	Sampling Frequency	
			Required	Proposed
Lakeport-Lakeport Blvd	060333001	LAK	1 in 3 day	1 in 6 day

LAK Lake County AQMD

5.2 PM_{2.5} Chemical Speciation Sampling Frequency

There are no plans to deploy a chemical speciation sampler in the Lake County MPA.

5.3 PM10 Sampling Frequency

The Lake County AQMD requested an exemption from the required sampling schedule of 1-in-3-day based on the low PM10 levels in the district. Measured PM10 concentrations in Lake County MPA have never exceeded the annual or the 24-hour PM10 NAAQS. The request was approved by the U.S. EPA Region 9.